

Gross Domestic Product

ECON8069 - Topic 7

Australian National University

Introduction to Macroeconomics

- Why we do Macroeconomics
- Gross Domestic Product
- Measurement of GDP
- Shortcomings of GDP

Textbook: Chapter 19, Section 20.1, Section 21.1

What is Macroeconomics?

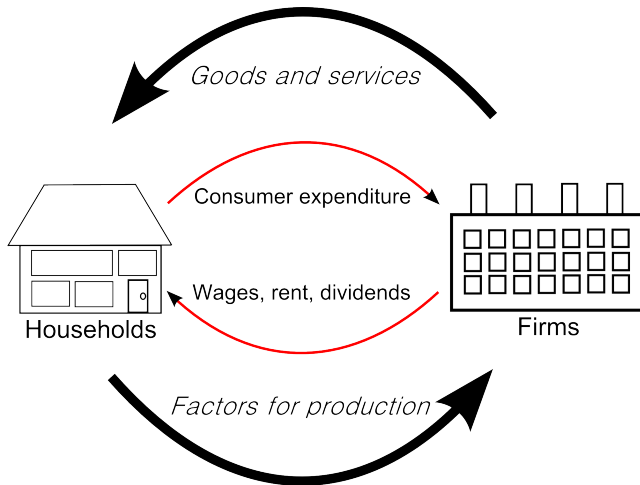
- Microeconomics:
 - Study of choices by individual consumers, individual businesses
 - How these choices effect individual markets
 - Government intervention at the single-market level
- Macroeconomics:
 - Study of the aggregate, or whole, economy
 - Studies the performance of the national and global economy
 - Concerned with questions of aggregate production, aggregate prices, inequality, and growth

Why is Macroeconomics?

The Paradox of Thrift and the Birth of Macroeconomics:

- If an individual suffers a negative income shock, microeconomic theory says they should reduce consumption.
- Perhaps economies should work the same way. If the economy has a negative income shock, should the government reduce spending?
- This was the policy proscription in the US (and Australia) in the 1930's during the Great Depression.
- BUT, since my income is just someone else's expenditure, when everyone spends less, everyone makes less.
- The 'cutting spending policy' was a huge failure. Sometimes the whole is not merely the sum of it's parts.

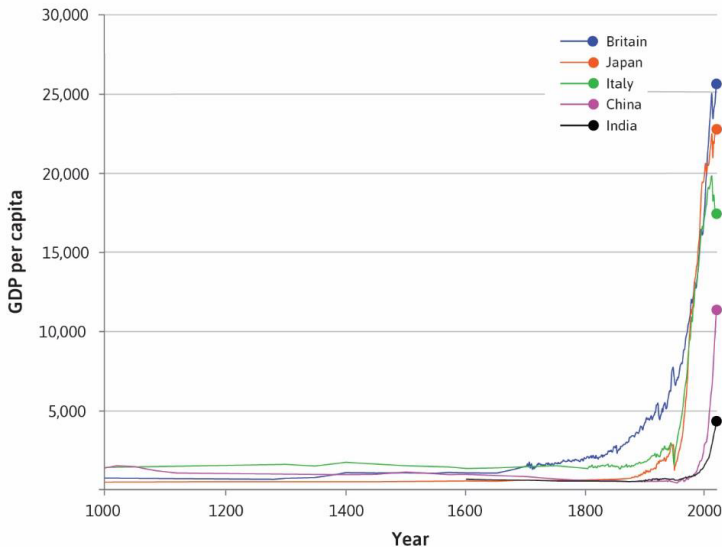
Circular Flow Model



Macroeconomic Models

- Macroeconomic Models try to explain these aggregate variables
- Use variables like aggregate production (GDP), aggregate prices (inflation, wage rates), and unemployment
- Substantial difficulties with testing led to many competing 'schools of thought'
- These school of thought no longer really exist; there is broad consensus on 'orthodox macroeconomics'

Growth - The Hockey-stick



Inequality between countries

- Gapminder is an online tool that gives excellent visualisations for inequality (and also growth).
- Let's go there now; at <https://www.gapminder.org/tools/>
- Take-home 1: Modern-day middle-income countries look a lot like rich countries from 50 years ago.
- Take-home 2: The world no longer has 'developed' and 'developing' countries, but rather has a continuum.

Gross Domestic Product

- Gross Domestic Product (GDP) is a measure of the total production of a country over a given period of time.
- GDP is usually expressed in *per capita* terms (so GDP per person).

Gross Domestic Product

GDP is the market value of all the final goods and services produced within the economy during a given period of time.

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- GDP combines the value of many different kinds of goods (steel, oil, apricots, IT services, etc.) by using the *market value* of those goods.
- If a kilogram of steel costs ten times as much as a kilogram of apricots, then the kilogram of steel will contribute ten times as much as the kilogram of apricots.
- Important to remember: GDP is about **production**. We want to count things that are produced, and not anything else.

GDP and the Circular Flow

- The circular flow diagram we looked at is vastly oversimplified.
- However, the basic principle of circular flow in the economy is that

$$\text{Income} = \text{Expenditure} = \text{Production}$$

- So if we want to measure Production, then we could instead measure expenditure, or income. We usually use the expenditure approach.

Expenditure Approach to GDP

GDP (Y) is divided into the following categories:

- Consumption (C)
- Investment (I)
- Government Expenditure (G)
- Net Exports (NX), which is Exports minus Imports

$$Y = C + I + G + NX$$

Components of National Income Accounts

- Consumption: market value of goods and services bought by domestic households
- Investment: market value of *new* physical capital bought by households and firms
- Government Expenditure: market value of government purchases of goods and services
- Net Exports: market value of goods and services bought by *foreign* firms, households, and governments (exports), minus the value of foreign-produced goods and services bought by domestics.

Two subtle parts of GDP

1. Housing:

- New housing expenditure is counted as Investment always
- Existing housing is never part of GDP (nothing was produced)

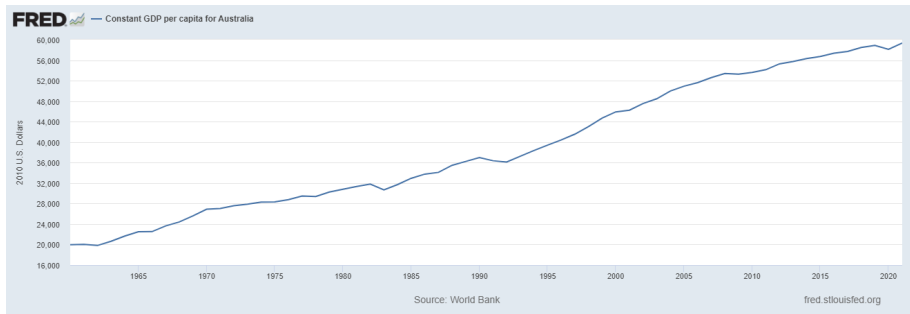
2. Welfare:

- Government welfare payments (transfer payments) are not counted in GDP (nothing is produced)
- When these welfare payments are used to buy actual goods and services, they are counted at that time.
- In general: for GDP questions, first think about what was produced, then try to work out which component of GDP it is

GDP of selected countries

- We will go through the GDP (and GDP growth) of China, India, Australia and the US, from 1960-2018.
- All graphs are looking at GDP *per capita*, so population growth has been factored out.
- All graphs use a variant of Real GDP, so price changes have been factored out.
- Graphs of GDP will be on a log scale. This means that if the country is growing at 5% per year every year, the graph will look linear.
- All data is taken from FRED: <https://fred.stlouisfed.org/>

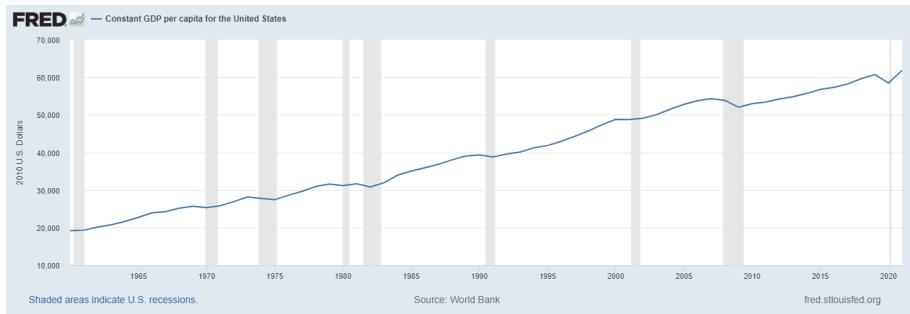
GDP Australia



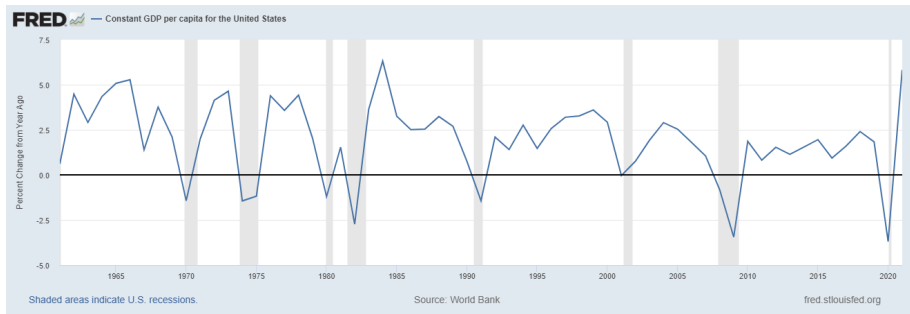
GDP Growth Australia



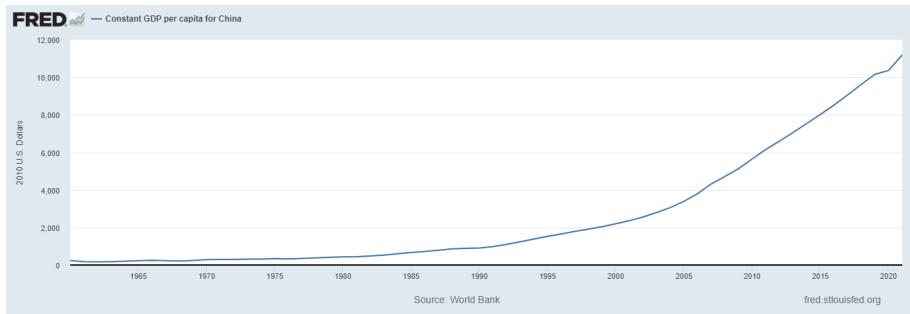
GDP United States



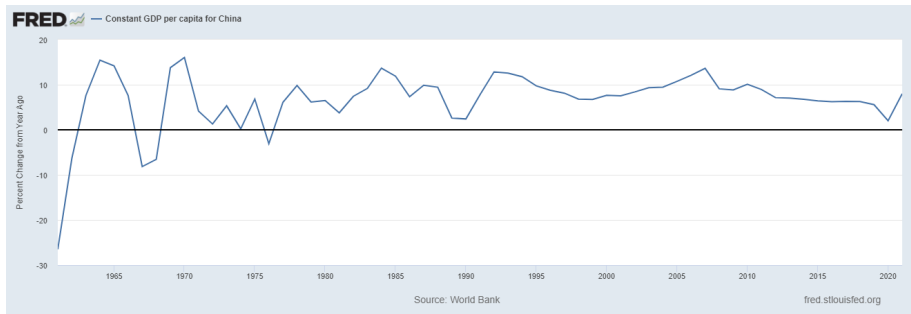
GDP Growth United States



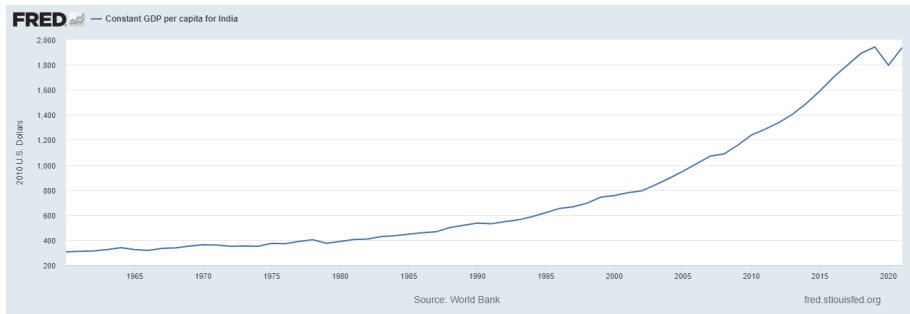
GDP China



GDP Growth China



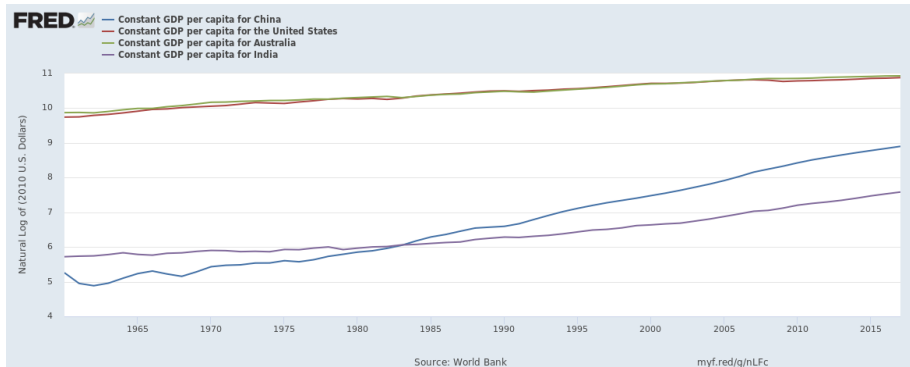
GDP India



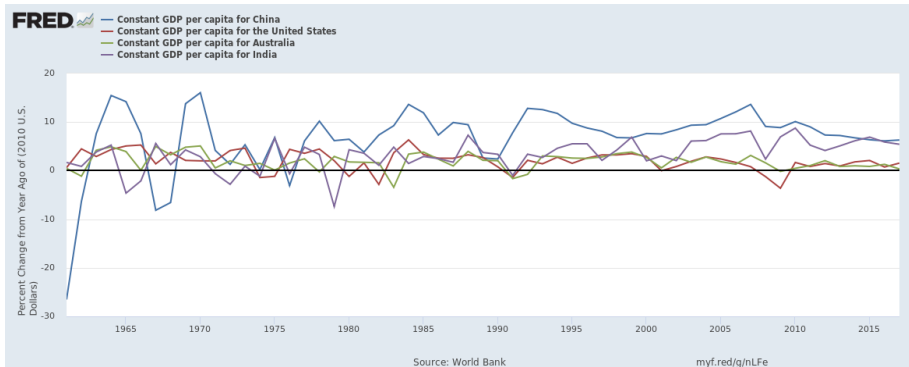
GDP Growth India



GDP Comparison



GDP Growth Comparison



Calculating GDP

- We find GDP by multiplying the quantity of each good sold by its price, and adding these values together
- When using current prices, we are measuring *nominal* GDP.

Year	Price of Butter	Quantity of Butter	Price of Guns	Quantity of Guns
2017	\$2	150	\$1	400
2018	\$3	200	\$1.50	600
2019	\$4	175	\$2.50	500

Year	Price of Butter	Quantity of Butter	Price of Guns	Quantity of Guns	
2017	\$2	150	\$1	400	
2018	\$3	200	\$1.50	600	
2019	\$4	175	\$2.50	500	
	Value of Butter		Value of Guns		GDP (nominal)
2017	$\$2 \times 150 = \300		$\$1 \times 400 = \400		\$700
2018	$\$3 \times 200 = \600		$\$1.5 \times 600 = \900		\$1500
2019	$\$4 \times 175 = \700		$\$2.5 \times 500 = \1250		\$1950

- When GDP increases between years, then at least one of the following must have happened:
 - more goods were produced
 - goods became more expensive
- We need to be able to disentangle these effects
- Notably from the previous example: GDP from 2018-2019 increased, even though production of all goods fell.

- To calculate real GDP, we use prices from a *fixed base year*, and multiply this by the quantities from other years
- Therefore, if GDP increases, it must be because more was produced
- You should always talk about Real GDP (or some variant of this). Nominal GDP is almost entirely irrelevant.
- Nominal GDP is used most often when politicians want to pretend the economy is growing faster than it 'really' is

Year	Price of Butter	Quantity of Butter	Price of Guns	Quantity of Guns	
2021	\$2	150	\$1	400	
2022	\$3	200	\$1.50	600	
2023	\$4	175	\$2.50	500	
	Value of Butter (2017 prices)		Value of Guns (2017 prices)		GDP (real)
2021	\$2 × 150 = \$300		\$1 × 400 = \$400		\$700
2022	\$2 × 200 = \$400		\$1 × 600 = \$600		\$1000
2023	\$2 × 175 = \$350		\$1 × 500 = \$500		\$850

Year	Price of Butter	Quantity of Butter	Price of Guns	Quantity of Guns	
2021	\$2	150	\$1	400	
2022	\$3	200	\$1.50	600	
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2021	\$4 × 150 = \$600		\$2.50 × 400 = \$900		\$1500
2022	\$4 × 200 = \$800		\$2.5 × 600 = \$1500		\$2300
2023	\$4 × 175 = \$700		\$2.5 × 500 = \$1250		\$1950

GDP growth rate

- We often look at growth rates of real GDP (or real GDP per capita as earlier).
- Growth rate of real GDP will depend on choice of base year.
 - With 2021 prices, growth was 42.8%, and -15% .
 - With 2023 prices, growth was 53.3% and -15.2% .
 - The difference is because guns are more important with the 2019 prices.
- Real-world data uses chain-weighted measures, which we will not discuss here.

Approaches to GDP Calculation

There are three methods we can use to calculate GDP:

- Expenditure Approach
- Value-added/Production Approach
- Income Approach

Expenditure Approach to GDP

- Adds up the final value of all goods and services sold in the economy.
- Uses the $Y = C + I + G + NX$ from earlier.

Production Approach to GDP

- The production approach sums up the *value-added* by each firm at each step of production
- The value-added by a firm is the difference between the firm's revenue from sales, and the costs of intermediate goods
- A firm buys steel for \$10 million, and transforms it into \$40 million in ball bearings. The value-added is \$30 million
- Notably: raw inputs (particularly extracted minerals) are usually NOT considered as an input with a cost.

Income Approach to GDP

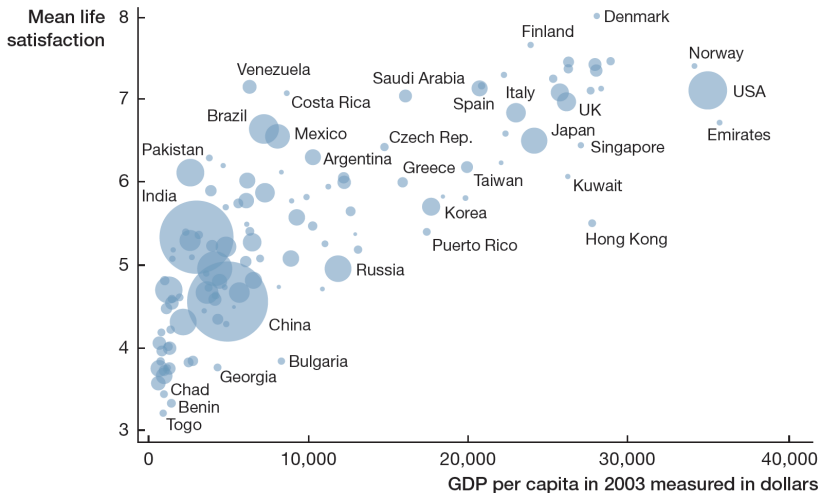
- Since $\text{Income} = \text{Expenditure}$, we can instead try to measure income directly
- Since aggregate income equals aggregate output we can write:

$$GDP = \text{wages} + \text{interest payments} + \text{taxes} + \text{depreciation} + \text{profits}$$

Problems Measuring GDP

- Changes in product **quality** are difficult to account for. Especially tricky in fast-improving industries like IT.
- Measuring output of the **service** industry is difficult. Particularly whether something is a final good, or an intermediate good.
- GDP does not measure **non-market** goods such as household work.
 - This means GDP underestimates true production levels
 - Also, means GDP will overestimate growth rates as people move from unpaid to paid work

GDP and Well-being (2013)



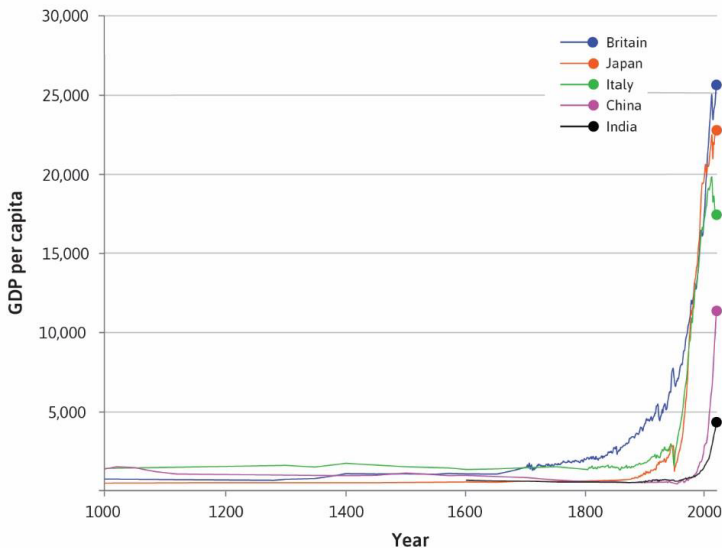
Measuring Economic Well-being

- Many positive attributes (health, education, etc.) are positively correlated with GDP.
- Countries that are rich can use that wealth to increase health outcomes, and educate their population.
- However, GDP does not *need* to be used for these purposes.
- Inequality within the country could also reduce aggregate welfare, even if it does not drastically effect GDP.
- Pollution is also not measured in GDP, but is obvious very important for well-being.
- <https://www.youtube.com/watch?v=77IdKFqXbUY>
 - “it (GDP) measures everything, in short, except that which makes life worthwhile”

Human Development Index

- The Human Development Index (HDI) is a composite score of real GDP, life expectancy and education.
- More information on the HDI and the 2022 report can be found at <https://hdr.undp.org/content/human-development-report-2021-22>
- Top 10 countries by HDI (2022 report) are: Switzerland, Norway, Iceland, Hong Kong, Australia, Denmark, Sweden, Ireland, Germany, Netherlands.

Economic Growth



Timing of Growth Take-Off

Different countries started their sustained economic growth at different times:

- Britain is first in about 1750 (first industrial revolution)
- Japan flips around 1870 (Meiji restoration)
- China and India start growing in the second half of the 20th century
- General Trend: European countries start developing in the early 1800's due to technology (and colonialism)
- Asian and African countries start developing in the post-colonial era, from the 1950's onward

Technological Revolutions

- A **technology** is any process which uses inputs to produce an output. Inputs might be physical inputs (steel, coal, etc.) but most often we think of *time* as the most important input.
- By reducing the amount of inputs needed, technological change allows an increase in living standards
- Light-production is perhaps the greatest technological improvement:
<https://www.nber.org/chapters/c6064.pdf>

Year	1750 BCE	1800 CE	1900 CE	1992 CE
Cost of Light (1 hour of light)	41 hours	5 hours	2.2 hours	0.00012

Environmental Consequences

- Increased production and population growth has the (realised) potential to negatively impact the environment
- Local impacts - pollution in cities, deforestation, polluted waterways
- Global impacts - climate change
- These effects are due to both the expansion of the economy, and the way the economy is organised (what kinds of things are valued)
- Technology *may* hold the solution to this problem

Long-Term Mixed-Market Growth

Mixed-market here refers to markets with both capitalist structures, as well as various constraints on those structures. Mixing capitalist economies with planned economies

- Long-run growth is spurred by **technological innovation**
- Technological innovation requires **stable political conditions**
- **Markets**, in which less productive firms fail and leave the market, encourage technological innovation
- The growth of productive firms, and the failure of non-productive firms, leads to **specialisation**